REMARKS

Claim 3 was allowed.

The Examiner again rejected claims 1, 4, 5, 7-11, 13, 14, and 16-19 pursuant to 35 U.S.C. § 102(b) as anticipated by Brisken (U.S. Patent No. 4,530,363). Claims 2 and 11 were again rejected pursuant to 35 U.S.C. § 103(a) as unpatentable over Brisken in view of Nudell, et al. (U.S. Patent No. 5,085,220). Claim 12 was again rejected pursuant to 35 U.S.C. § 103(a) as unpatentable over Brisken in view of Buck, et al. (U.S. Patent No. 6,544,181). Claim 16 was again rejected pursuant to 35 U.S.C. § 103(a) as unpatentable over Brisken in view of Fu, et al. (U.S. Patent No. 4,431,936). Claims 9 and 18-20 were rejected pursuant to 35 U.S.C. § 103(a) as unpatentable over Brisken in view of Robinson, et al. (U.S. Patent No. 6,419,633).

Applicants respectfully request reconsideration of the rejections of claims 1-2, 4-5, 8-14, and 15-20, including independent claims 1, 8, 9, and 18. *New arguments are added in italics.*

Independent claim 1 recites providing different transmit waveform polarity and apodization to different groups of elements for measuring volume flow simultaneously.

For this limitation, the Examiner cites to col. 4, lines 23-29 of Brisken. Brisken shows providing focus by relative delays between annular elements at col. 4, lines 23-29. Firing the annular elements in sequence from the outer element (12) to the inner element (1) accounts for the different distances from each annular element (12-1) to a center point (col. 4, lines 23-29; and Figure 8). Brisken uses sequential firing – delaying the start of transmission from each element. Brisken does not disclose different waveform polarity, and do not suggest providing different transmit waveform polarity and apodization to different groups of elements simultaneously.

In response, the Examiner notes that "a change in waveform polarity is well known to those skilled in the art," notes that different transmit characteristics would include polarity, and cites to Fu, et al. and Mo, et al. for official notice of varying polarity. Change in relative phase is known for focusing. Polarity is a dipole or positive verses negative (two poles) concept. Relative phasing for focus does not use different polarity, but instead uses small

changes in phase. The cited portion of Fu, et al. shows focusing, but not different polarity. For harmonic imaging, multi-pulse techniques may change polarity for sequential transmissions. However, the different polarity pulses are from the same elements at different times, not provided for groups of elements simultaneously. (See Fig. 1, right side, of this application). The cited portion of Ma, et al. notes apodization, but does not provide different polarity. Brisken does not provide different polarities simultaneously. A person of ordinary skill in the art would not have used different polarities simultaneously since none of the citations disclose different polarity and different polarity would interfere with the focusing (constructive addition of phased waveforms) taught by the references.

Independent claim 8 recites three rows having a first length, but a kerf extending in azimuth less than the first length such that at least one kerf-defined element has a greater elevation extent than another kerf-defined element of the array. The Examiner cites to rows [18-26], [27-35], and [36-44] of Figure 5 as the three rows. The kerf along row [18-26] shared with [11-17] is noted as not being as long in azimuth as the three rows (e.g., [18-26]).

Brisken uses square elements arranged in an approximation to a circle in circumference (see Figure 5). Accordingly, the outer rows (e.g., [1-3], and [11-17]) are progressively shorter by having fewer elements. All of the elements are defined by the surrounding kerfs separating the transducer material in the same size squares. During 2D imaging, Brisken applies common timing to groups of elements having different elevation extent (col. 3, lines 40-50; and Figures 6A and 6B). However, these different groups are formed from the same size base (kerf-defined) elements. Electrical grouping of kerf-defined elements provides for a different size transmitter or receiver, but is still made of a plurality of kerf-defined elements each with a same size. Brisken does not disclose at least one kerf-defined element having a greater elevation extent than another kerf-defined element of the array.

The Examiner does not address this argument regarding an element having a different elevation extent due to the shortened kerf. Brisken and Robinson, et al. both use uniform elements as defined by the kerfs. The elevation extended elements are used for imaging, but may not be used for annular array operation. This arrangement maximizes the use of beamformer channels.

Independent claim 9 recites at least four rows in a fully sampled NxM grid of elements providing a rectangular outer circumference of the array. As discussed above, Brisken approximates a circle in the outer circumference rather than an NxM grid.

The Examiner alleges the rectangular as obvious design choice since there is no cited criticality, and points out that Robinson, et al. use a rectangular array. Criticality is provided due to ease of manufacture of a rectangular grid. Elements are formed from slabs, straight line cuts all the way along the slab are easier and efficient. Providing the circular circumference of Brisken is difficult, and may lead to more faculty arrays. Robinson, et al. use a rectangular array for 2D and 3D scanning along a plane or the dimensions in a volume. Such axial scanning may operate well with a rectangular array. Brisken uses a circular circumference since an annular array is to be emulated with many small elements. A person of ordinary skill in the art would not have used a rectangular array for the annular emulating array of Brisken.

Independent claim 18 recites a kerf extending less than an azimuth length of the array such that at least one kerf-defined element has a greater elevation extent than another kerf-defined element of the array. Claim 18 is allowable over Brisken for the same reasons as claim 8.

Regarding the rejection including Robinson, et al., Robinson, et al. provide the same sized kerf-defined elements as well.

The dependent claims depend from corresponding independent claims, so are allowable for the same reasons.

Other dependent claims include limitations the same or similar to other independent claims, so are allowable for the same reasons.

For example, claim 12 is allowable for the same reasons as claim 3. Claim 12 has been amended to tie the imaging and flow measuring to the same array. *The Examiner has not acknowledged allowability or disagreed.*

As another example, claim 16 is allowable for the same reasons as claim 1. The Examiner relies on Fu, et al. for claim 16, rather than Brisken for claim 7 (incorporated into claim 1). Fu, et al. disclose a field direction parameter. The field direction defines relative delays to be used for different elements to focus the transmitted waves in a direction. Both

Brisken and the cited portion of Fu, et al. do not disclose different or opposite polarity of the transmitted waveforms.

Further limitations patentably distinguish from the cited references. For example, claims 19 and 20 recite relative kerf-defined element sizes. The Examiner notes the sparse array of Robinson and associated switching configuration, and then concludes that the possibility of structural configuration and thus the configuration would have been known to a person of ordinary skill in the art. However, a possibility does not suggest actual configuration.

Electrical switching of a sparse array does not result in elements with the recited sizes. The switched elements are still the same size. The kerfs define the elements, and switching several kerf-defined elements of a same size together merely creates a larger transmitter or receiver, but does not change the kerf structuring of the elements.

Different elevation extents of elements are difficult to create with typical kerf forming (e.g., dicing saw) techniques. At the end of a kerf, the adjacent element should not be damaged, yet the kerf should extend substantially through the slab to form other elements. A person of ordinary skill would not have used elements of different size, especially where Brisken and Robinson, et al. both teach uniform elements as sufficient.

CONCLUSION

Applicants respectfully submit that all of the pending claims are in condition for allowance and seeks early allowance thereof. If for any reason, the Examiner is unable to allow the application but believes that an interview would be helpful to resolve any issues, he is respectfully requested to call Craig Summerfield at (312) 321-4726.

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